

## CHLOROPHYLL CONTENT IN BEAN (*PHASEOLUS*) IN SALINE SOIL WITH FOLIAR-APPLIED OF IRON SULFATE

María Teresa Rodríguez-González\*, J. Alberto Escalante-Estrada\*, Mario Gutiérrez Rodríguez\* y Ricardo Vega Muñoz\*.

\*Orientación en Botánica.Ecofisiología de Cultivos. Campus Montecillo.Colegio de Postgraduados, Montecillo, Edo. de México, CP 56230, México.

### INTRODUCTION

Saline soils with high pH that exhibit Fe deficiency, present a problem for producers in low-rainfall climates throughout the world. When sorghum and corn are sowed in this soils, they show chlorosis (Godsey, 2003). One of the most used method for Fe deficiency correction, is foliar application of Fe solutions of ferrous sulphate ( $\text{Fe SO}_4 \cdot \text{H}_2\text{O}$  or  $\text{Fe SO}_4 \cdot 7\text{H}_2\text{O}$ ). This correction method usually alleviates chlorosis. The aim of this research was to evaluate several treatments of ferrous sulphate foliar application, to minimize the chlorosis, caused by Fe deficiency in bean, in saline soil with high pH.

### MATERIAL AND METHODS

Research was carried out in Montecillo, Mexico ( $19^\circ 98' \text{W}$  and 2250 m of altitude), with dry climate BS1, during the rainy season. The treatments were three cultivars of bush bean (*Phaseolus vulgaris* L.) Bayomex, and Canario-107 (determinate, Type I) and Criollo (indeterminate, Type II); one cultivar of (*Phaseolus coccineus* L.) Ayocote (indeterminate type II); two population densities: 6.25 (80X25 cm) and 12.50 (40X25cm) plants  $\text{m}^{-1}$  and three levels foliar sprays of  $\text{Fe SO}_4$ : 0, 2 and  $4\text{g L}^{-1}$  water, applied each 15 days after emergence (on June 19<sup>th</sup>, 2000), for five times. The soil characteristics were a clay soil; pH 8 to 8.7 and E.C. 7 to 14  $\text{dSm}^{-1}$  and a percentage of exchangeable sodium of 9.73 to 37. When the soil is moist from rain the E.C. is reduced to 2  $\text{dSm}^{-1}$ . All experiment was fertilized with 100-100-00 NPK. The experimental design was split plot with four replicates. The chlorophyll content in the four cultivars of bean was determined by two methods: destructive "slow" method (24 hours, Inskeep and Bloom, 1985) and fast method (five minutes), using the chlorophyll meter or SPAD meter (SPAD-502, Minolta Ramsey, NJ). In each plot, four readings were taken at random from the uppermost fully expanded leaf, first the SPAD lectures, then the samples for "destructive" method (two circles of one cm of diameter each one, for each sample). The analysis of chlorophylls were made to the 76 and 90 days after sowing (das), in reproductive stage.

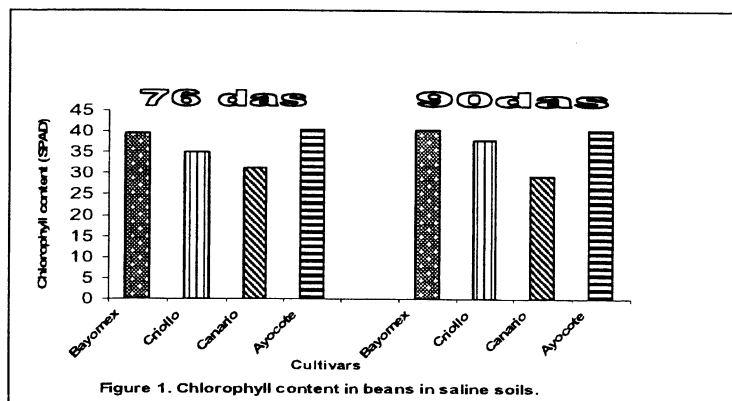
### RESULTS AND DISCUSSION

The readings of the SPAD can be reliable estimators of Chlorophyll content in bean plant, since both variables show a high relation ( $r^2=0.87$  \* to 0, 92 \*\*, Table1).

Table 1. Relation Chlorophyll content and SPAD lectures in bean Cultivars. Equations based on two dates of Chlorophyll analysis.

| Cultivar    | Equation: Chlorophyll content ( $\text{mg L}^{-1}$ ) vs. SPAD lectures. | $R^2$ | Prob F. |
|-------------|---|-------|---------|
| Bayomex     | $Y = 1.0006X - 22.809$  | 0.87  | *       |
| Criollo     | $Y = 0.6438X - 7.0894$  | 0.90  | **      |
| Canario-107 | $Y = 0.6572X - 7.9262$  | 0.92  | **      |
| Ayocote     | $Y = 0.6296X - 7.1863$  | 0.90  | **      |

\*, \*\*  $F > 0.05$  and  $0.01$ , respectively.



Thus, in figure 1, it was observed at 76 and 90 (das), that Ayocote showed the highest chlorophyll content, followed of Bayomex and Criollo; and the lowest corresponded to Canario. These differences were significant ( $P > 0.05$ ). With the application of ferrous sulphate, the plants showed greater content of Chlorophyll. Bayomex and Ayocote with 2 g of ferrous sulphate  $\text{L}^{-1}$  showed the highest values of Chlorophyll (19  $\text{mg L}^{-1}$  in average) and Canario (without ferrous sulphate) the lowest (11.8  $\text{mg L}^{-1}$ ). Finally, these results suggest variations in chlorophyll content between cultivars. With the ferrous sulphate can prevent chlorophyll degradation in the leaves of bean and so get a longest duration of the photosynthetic activity. The response to ferrous sulphate will depend of the cultivar in study.

## REFERENCES

- Godsey, C.H.B., Schmidt, J.P., Schlegel, A.J. Taylor, R.K. Thompson, C.R. and Gehl R.J. 2003. Fertilizer management. Correcting Iron deficiency in corn with Row-Applied Iron Sulfate. *Agron. J.* 95:160-166.
- Inskeep, W.P. and Bloom, P.R. 1985. Extinction coefficients of chlorophyll a, b and Total in N,N-dimethylformamide and 80% acetone. *Plant Physiol.* 77:483-485.